Abstract of the Disclosure

A method for fabricating a membrane-electrode assembly, and fuel cells adopting a membrane-electrode assembly formed by the method, wherein the method includes: coating nano-sized catalytic metal particles on a proton exchange polymer membrane by sputtering a catalytic metal source; coating nano-sized carbon particles on the proton exchange polymer membrane by arc discharging or by sputtering a carbon source to form a nanophase catalyst layer; and bonding electrodes to the proton exchange polymer membrane having the nanophase catalyst layer. The nano-sized catalytic metal and nano-sized carbon particles can be coated on a proton exchanger polymer membrane to form a catalyst layer by simultaneously sputtering a catalyst metal source and a carbon source.